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Ovarian Hyperstimulation and Oocyte Harvesting Prior to Systemic Chemotherapy—A Possible Pitfall in ^{18}F-FDG PET/CT Staging of Oncologic Patients

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Abstract: A 33-year-old woman with Hodgkin disease Ann Arbor stage IIA underwent baseline ^{18}F-FDG PET/CT scanning. The scan showed gross multicystic enlargement of both ovaries and a nodule at the edge of the right ovary with intense FDG uptake (SUVmax = 14.8). Differential diagnosis would include ovarian lymphoma manifestation, endometrioma, and ovarian or pelvic neoplasia. However, chart analysis revealed previous superstimulation with gonadotropins and gonadotropin release hormone antagonist, and transvaginal oocyte retrieval the day before FDG PET/CT. This led to the diagnosis of ovarian hyperstimulation syndrome, with the FDG-avid focus representing a hemorrhagic follicle after transvaginal oocyte retrieval procedure.

Key Words: assisted reproductive therapy (ART), FDG PET/CT, Hodgkin disease, lymphoma, ovarian hyperstimulation syndrome (OHSS), transvaginal oocyte retrieval (TVOR)

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FIGURE 1. An initial CT scan 3 weeks before the FDG PET/CT scan showed no subdiaphragmal lymphoma manifestation, ascites, or pelvic mass. Both ovaries were normal in size and morphology (black arrows).

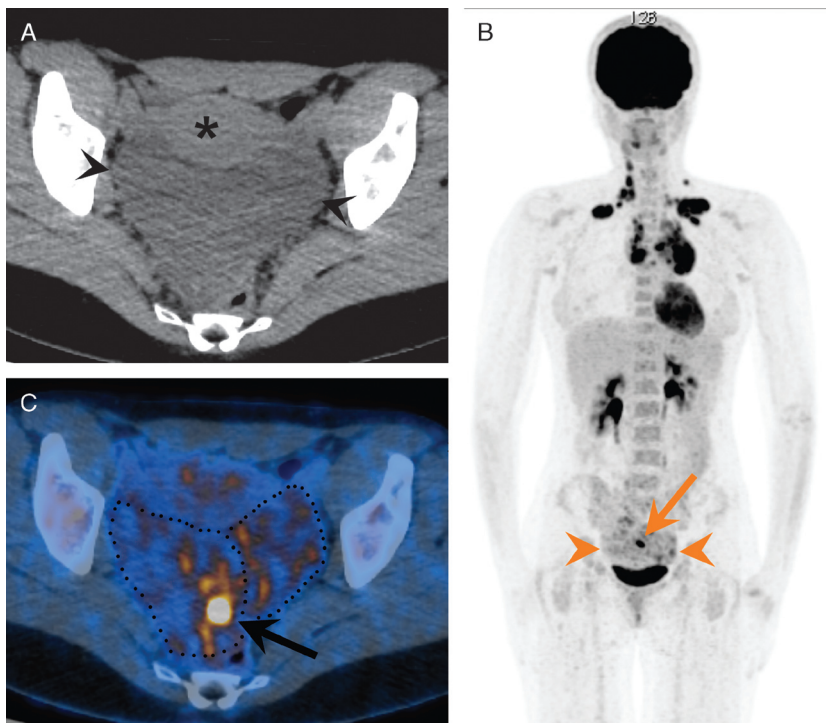

FIGURE 2. Three weeks later, the "low-dose" CT scan (**A**) of FDG PET/CT showed bilateral hypodense cystic masses in the pelvis, representing grossly enlarged ovaries (arrowheads), normal-sized uterus (asterisk), and a small amount of pelvic fluid. The coronal MIP PET image (**B**) delineated bilateral faint and patchy FDG uptake of the ovaries (orange arrowheads), with one focus of intense uptake (orange arrow; SUVmax 14.8) situated at the edge of the right ovary, as seen on the corresponding transverse FDG PET/CT image (**C**; intense focus, black arrow; enlarged stimulated ovaries, encircled with dotted line); TVOR had been performed the day before the FDG PET/CT scan. Ultrasound-guided TVOR is a technique used for in vitro fertilization as part of assisted reproductive therapy (ART) procedures. Doubling over the last decade, ART has become a popular treatment for infertility, being responsible for approximately 1.5% of live births in the United States in 2011.[1] Young oncological patients undergo this procedure for fertility preservation. For TVOR, all accessible follicles are aspirated. Complications of the procedure are unusual. If occurring, they can lead to iatrogenic ovarian hyperstimulation syndrome (OHSS), taking a severe course in approximately 1%.[2] Serious clinical conditions include hemoconcentration, thromboembolism, renal failure, and adult respiratory distress syndrome.[3–5] An ovarian manifestation of Hodgkin disease is among the differential diagnoses for new metabolically active pelvic lesions. Such would change the Ann Arbor stage from IIA to IV in our patient. Secondary ovarian involvement in lymphoma is more common than primary involvement, both being mainly seen with non-Hodgkin lymphoma.[6,7] Other differential diagnoses for FDG-avid ovarian lesions are endometrioma, primary and secondary ovarian malignancy, and corpus luteum cyst.[8–17]

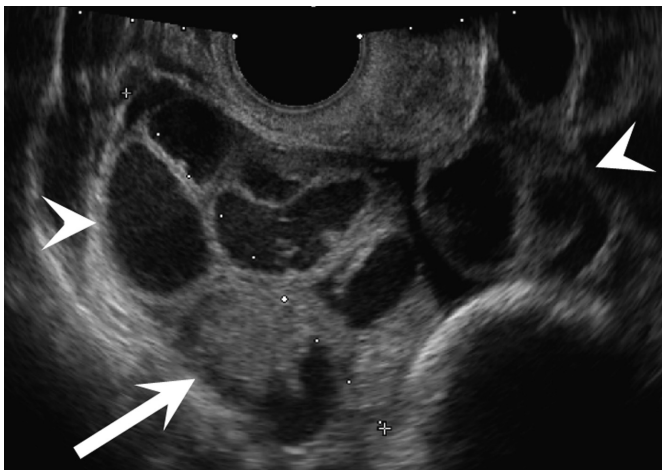

FIGURE 3. FDG PET/CT imaging features were in line with transvaginal ultrasound: the follicular hyperplasia within the enlarged ovaries (white arrowheads) corresponded to the typical "spoke wheel" pattern of stimulated ovaries.[18] Our patient had mild to moderate clinical symptoms of OHSS. The FDG-avid focus seen on PET/CT corresponded to prominent clotting due to postprocedural hemorrhagic changes in one enlarged follicular cyst within the right ovary (white arrow), whereas all other follicle cysts showed only mild signs of hemorrhage. One recent report describes changes after TVOR and ovarian stimulation, confirming diffuse FDG uptake in bilaterally enlarged ovaries.[19] Our case additionally demonstrates that foci of intense uptake might occur shortly after the procedure and represent clotting at the site of follicle aspiration. The imaging pattern of bilaterally enlarged ovaries containing an FDG-avid focus in the setting of a young female oncologic patient scanned before the start of chemotherapy should therefore raise the suspicion of previous ovarian stimulation and TVOR, and should not be confounded with an ovarian manifestation of the oncologic illness.